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GRANULAR WEIGHT OF VARIOUS DONBASS COALS

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During recent years there have been special attempts at the coke-chemical plants to increase the charges of the coking furnaces by raising the granular weight (weight of one cubic meter of dry, granular materials) of coking charges. The Power Engineering Institute, (ENIN), Academy of Sciences USSR played a significant role in solving this problem by moistening the coal charges with small additions of hydrocarbon liquids. Writings pertaining to the characteristics of granular weight of Kuzbass, Karaganda, and Kizel coals were also published.

The property of the granular weight of the crushed coals in the above-mentioned operations was obtained from the relations, experimentally determined for each type of coal, between the granular weight of the coal to its moisture content and to the addition of kerosene in the presence of a definite moisture content. The research showed that the behavior of the coals of the above-mentioned coal basins in respect to the granular weight is similar, namely the basic relationships between the granular weight of the coal and its mositure content and between the amount of organic liquids added to the coal and its granular weight are analogous for all the coals studied. The difference between the granular weight of the various types of coal depends upon the absolute values of the granular weight determined by the moisture content of the coal and the quantity of organic liquid added.

When moistening the coals with water, the lowest granular weight was obtained for the coals in the middle stage of carbonification. Coking coals and fat coals showed the greatest increase of granular weight when moistened by small additions of hydrocarbon liquids. The result obtained by the increase in granular weight diminished with the degree of transition to gas coal on the one hand and to lean coal and anthracite on the other. The differences in the absolute values of the granular weights of the various types of coal permit the assumption that the granular weight of the coking charge depends to a considerable degree on the composition of the coking charge by components.

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To obtain the properties of the granular weight of various Donbass coals, the relationships of their granular weight to the moisture content and to the addition of kerosene in the presence of a definite moisture content were experimentally determined according to ENIN's method. The results showed that the same relationship exists for the granular weights of the Donbass coals as for the granular weights of the coals of the other basins.

The granular weight of all coals tested diminishes with the increase of moisture content, reaches the minimum value at a moisture content of 7-8 percent, and begins to increase with further moistening. The change of the granular weight through the addition of kerosene shows a characteristic increase even with addition of a hundredth part of one percent of kerosene. The granular weight reaches its maximum value when the optimum quantity of kerosene has been added and drops when the amount of kerosene added is larger than the optimum quantity. For each coal the optimum quantity of kerosene increases with the increase of moisture content of the coal. The size of the maximum increase of the granular weight or the effectiveness of the optimum quantity of kerosene is a characteristic property of each type of coal.

If the moisture content is 5.25-6.2 percent, for example, the PZh (parovichno-zhirnyy, fat steam) coal and the K coking coal show the highest effectiveness; the PS (parovichno-spekayushchiy, clinker steam) coal shows a somewhat lower effectiveness. This fits the theoretical assumption according to which the K and PZh coals, in the middle stage of carbonification, possess the greatest effectiveness. The optimum quantity of kerosene constitutes 0.1-0.2 percent of the weight of the coal.

With a moisture content of 5.65 percent, the effectiveness for the coking charges reaches the significantly high figure of 26.6 percent. It is evident that a mixture of various coals in this case gives a type of a dispersal pattern where the possibilities for dense packing of particles is more favorable than in the separate coals.

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Changes of Granular Weight of Various Donbass Coals in Relation to Kerosene Added

	PZh-I				PZh-II			
	Moisture Content (%)							
	6.0		9.4		6.2		7.8	
	Granular Weight							
Kerosene Added (in percent)	Gm/ cu dm	Increase (%)	Gm/ cu dm	Increase (%)	Gm/ cu dm	Increase (%)	Gm/ cu dm	Increase (%)
0.0	568	0.0	534	0.0	558	0.0	560	0.0
0.05	620	9.3	563	5.4	634	13.6	611	9.1
0.1	648	14.1	572	7.1	657	17.7	632	12.9
0.15	672	18.3	576	7.9	684	22.6	636	13.6
0.2	666	17.3	575	7.7	686	22.9	647	15.5
0.3	665	17.1	592	10.8	684	22.6	658	17.5
0.4	662	16.5	603	12.9	674	20.8	666	18.9
0.5	654	15.1	613	14.8	670	20.1	652	16.4
0.6	--	--	--	--	649	16.3	645	15.2
0.7	--	--	600	12.3	--	--	--	--
0.8	--	--	--	-	-	--	--	--
A^c, %		8.37				8.46		
V^c, %		32.15				30.4		
Composition of Classes of Particles (in percent)								
0-1 mm		35				50		
1-3 "		45				35		
3-6 "		20				15		
>6 "		--				--		

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	K		PS-I			
Moisture Content (%)						
	6.0		7.4		8.45	
	Granular Weight					
Kerosene Added (in percent)	Gm/ cu dm	Increase (%)	Gm/ cu dm	Increase (%)	Gm/ cu dm	Increase (%)
0.0	560	0.0	550	0.0	531	0.0
0.05	576	20.7	635	15.4	583	9.8
0.1	681	21.6	652	18.6	593	11.7
0.15	679	21.2	669	21.6	600	13.0
0.2	676	20.7	672	22.2	614	15.6
0.3	670	19.6	662	20.4	622	17.1
0.4	666	18.9	661	20.2	639	20.3
0.5	--	--	--	--	633	19.2
0.6	--	--	--	--	634	19.4
0.7	--	--	--	--	631	18.8
0.8	--	--	--	--	--	--
A^c, %		5.33			--	
V^b, %		22.36			--	
Composition of Classes of Particles (in percent)						
0-1 mm		40			50	
1-3 "		42			38	
3-6 "		18			12	
>6 "		--			--	

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PS-II

Coking PZh-65%
K -25%
Charge PC -10%

Moisture Content (%)

5.25 9.5 5.65 7.45

Granular Weight

Kerosene Added (in percent)	Gm/ cu dm	Increase (%)	Gm/ cu dm	Increase (%)	Gm/ cu dm	Increase (%)	Gm/ cu dm	Increase (%)
0.0	573	0.0	566	0.0	556	0.0	567	0.0
0.05	622	8.5	573	1.2	665	17.5	621	9.5
0.1	645	12.6	586	3.5	701	23.8	625	10.2
0.15	670	16.9	597	5.5	718	26.8	665	17.3
0.2	669	16.7	603	6.5	701	23.8	667	17.6
0.3	667	16.4	604	6.7	697	23.0	685	20.8
0.4	665	16.0	620	9.5	695	22.8	687	21.2
0.5	663	15.7	618	9.2	686	21.1	686	21.0
0.6	--	--	--	--	--	--	672	18.5
0.7	--	--	-	--	--	--	--	--
0.8	--	--	--	--	--	--	--	--
A^c, %			7.17			--		
V^c, %			15.53			--		
Composition of Classes of Particles (in percent)								
0-1 mm			48			30.7		
1-3 "			38			46.3		
3-6 "			14			16.5		
>6 "			--			6.5		

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